Exploratory Study on Research Framework of Green Aid Effectiveness Focusing on Low Carbon Green Growth

By

Dohyun Park

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Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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ABSTRACT

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Monitoring and evaluation of green aid requires well-defined framework, strong criteria and a set of indicators. It also requires good understanding of determinants of aid effectiveness, careful and complete analysis of aid and its environmental impacts. However, lack of framework is a big challenge and green aid effectiveness has not been proved yet, further discussion and research is necessary. This study discusses the entire process of green aid monitoring and evaluation in a comprehensive manner including approach, the measurement framework, and data collection as well as indicators. This study mainly aims to: (1) review previous discussion about green aid and development; (2) discuss what should be developed to enhancing green aid effectiveness; and (3) suggest a research framework for measurement. This is an exploratory study starts from recognizing the limitation at the current situation. Therefore, main objective is opening the possibility of further discussion rather than providing a complete framework.

Dedicated to beloved family

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1. INTRODUCTION

The world has achieved substantial progress in various perspectives for the last several decades. The intensive development came from significant technological progress through massive industrialization and industrialization. However, as a result, the earth faced severe environmental challenges including climate change, environmental pollution, as well as energy exhaustion. Who are the most responsible for the crises? Since Kyoto Protocol in 1997, countries have been arguing for such a long time to shift the responsibility to each other. What more important is however the impact of the crises the world is facing rather than the responsibility cannot be divided. According to a study, the poorest countries and people are affected worst by climate change and environmental degradation (UNFCCC, 2007). Now the discussion should be focusing on how to fight for the challenges rather than why or who.

The conventional growth pattern was unsuccessful to address the crises properly and to seek sustainable growth. Therefore the development paradigm shift towards 'green' is unavoidable. Green growth is a new growth path towards sustainable economy – low carbon green growth. To do that, not only quantity but also quality of growth matters to handle the crises and ultimately to reach green economy. Opportunely, international society understands the challenges and urges closer international cooperation to reach the common goal. As a result, international communities pay a lot of attention to enhancing capacity to cope with environmental problems such as climate change and trans-boundary pollution. A report estimates about 2% of global GDP investment can kick-start a transition towards a low carbon green economy (UNEP, 2011). They argue green growth is not a simple idea for environmental clean-up but a systematic change of the entire economic condition for growth. Greening growth is therefore ensuring economic growth while preventing costly

environmental degradation, climate change, biodiversity loss, and unsustainable natural resource use.

Green growth aims to combine mutually supportive economic and environmental policies. By accounting environmental risks that could hold back social and economic progress, and improving competitive conditions in the economy, green growth policies will spur transformational change and ensure that investing in the environment can contribute to new sources of economic growth (OECD, 2011). The OECD defines green growth as follow.

> *Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyze investment and innovation which will underpin sustained growth and give rise to new economic opportunities.*
>
> *A return to "business as usual" would be unwise and ultimately unsustainable, involving risks that could impose human costs and constraints on economic growth and development. It could result in increased water scarcity, resource bottlenecks, air and water pollution, climate change and biodiversity loss which would be irreversible; thus the need for strategies to achieve greener growth.*

Despite the significance of greening growth, there is no thorough definition and boundary of 'green'. Because of its broad nature, defining and measuring green is not an easy task. Nevertheless, green aid is generally accepted as certain type of development assistance which supports climate change mitigation, adaptation and promoting green growth in developing countries. Although clearly defining the scope of green aid is difficult at this moment, green aid already takes an important part of development assistance. The trend is

incremental and it covers wide sectors including energy, technology, agriculture, water, waste, nature preservation, and forest.

In fact, development cooperation plays an important role to promoting green growth around the world. Recently in Durban, establishment of new global fund, the Green Climate Fund (GCF), has decided to facilitate climate change responses and to spread greening growth over the world. The scale of the fund is planned to be 100 billion USD which is much larger than that of current World Bank. Once it is created sooner or later, it becomes the most remarkable achievement of international cooperation for climate change response. The tremendous amount of fund will flow for green development cooperation, however, the lack of normative framework and unclear definition of green aid could hinder research development. Moreover, measurement framework and indicators do not exist so far which is the major challenge for developing green aid policy.

Monitoring green aid towards low carbon green growth requires well-designed framework, strong criteria for evaluation, and a set of relevant indicators. It needs to be developed carefully because it will significantly affect not only aid implementation but also impact evaluation of green aid in the future. This study firstly reviews previous works on green growth and green aid from academia and leading international organizations. The process will provide an significant implication to develop future research framework of green aid effectiveness. Therefore, this study discusses the entire process of green aid evaluation in a comprehensive manner including approach, the measurement framework, and data collection as well as indicators. This study therefore primarily aims to: (1) review previous discussion about green aid and development; (2) discuss what should be developed to enhancing green aid effectiveness in the future; (3) suggest a research framework for measurement. This is an exploratory study which starts from recognizing the limitation at the

current situation. Therefore, main objective of study is opening the possibility of further discussion rather than providing a complete framework.

2. LITERATURE REVIEW

2.1. Aid, Development and the Environment

2.1.1. Development and Environment

Since Rio, sustainability has been a core agenda of development. For the past several decades, many studies paid a great deal of attention to find out relationship between economic variables and the environment. Lofdahl (Lofdahl C., 2002) investigates whether international trade helps or hurts the environment; Copeland and Taylor (Copeland, B.R. and M.S. Taylor, 2000) establish a framework under which the impact of trade liberalization on an economy's adopted environmental standard can be assessed. They predicted that, at the national level, income gain affects pollution levels differently than income gain achieved through economic growth. The counter-part finding they also report is that economic growth affects pollution levels differently under free trade than under autarky. However, they find that economic growth in richer countries is likely to have very different environmental effects than economic growth in poorer countries.

Many scholars use the famous environmental Kuznets curve (EKC) to demonstrate their arguments about the relationship between economic activities and its environmental impacts. They try to find empirical evidence to support or disagree with the EKC relationship. Asafu-Adjaye (Asafu-Adjaye J., 1999) suggests pollution levels rise in the early stages of development but recede subsequently. He finds that the general thrust of the EKC vary by both country and pollutant type. He argues that the EKC relationship is fairly robust when environmental quality is pitched against income. For a large number of developing countries the per capita GDP is significantly below the predicted turning points. It suggests that

environmental problems in developing economies will more than likely deteriorate over coming years and decades.

On the other hand, many counter-arguments also discover empirical findings. Baojuan, Rongrong, Ying (Shi B. et al., 2011) demonstrate that there is no obvious EKC relationship between other environmental indicators and GDP per capita. They find that the emissions of industrial waste water and industrial solid waste will continue to rise through an observation in Tangshan, China. A World Bank working paper (Hallegatte S. et al., 2011) also argue there is no Kuznets curve when it comes to the economic and environmental pillars though there are some parallels. They explain environmental pollutants get worse even with higher income.

Some scholars take more variables into account to increase reliability of analysis. For example, some argue that technology progress may solve the problem. The Green Solow Model (Brock W.A. and Taylor. M.S., 2004) demonstrates that a key empirical finding in environmental economics – the EKC – and the core model of modern macroeconomics – the Solow Model – are intimately related. Once they amend the Solow model to incorporate technological progress in abatement, the EKC is a necessary by product of convergence to a sustainable growth path. They suggest the Green Solow Model that the forces of diminishing returns and technological progress identified by Solow as fundamental to the growth process, may also be fundamental to the EKC finding.

However, limitation of these researches is that they overlooked many other possible variables which may affect the result. Therefore, these theories have difficulties to be generalized. In fact, every country has different context and different development path which also makes the results vary. Thus, few indicators cannot fully explain the actual relationship. Jumping to a conclusion based on findings from few indicators has risk to

manipulate the result by intensions. However, these analyses at least give important implications to understand general tendency between development and the environment.

2.1.2. Aid and Environment

Surprisingly, only few studies explore the relationship between aid and the environment. Chao and Yu (Chao, C.C., and E.S.H. Yu, 1999) examined welfare effects of tying aid to environmental clean-ups. Similarly, Hatzipanayotou, Lahiri, and Michael (Hatzipanayotou, P., S. Lahiri, and M.S. Michael, 2002) develop a two country model of aid and cross-border pollution resulting from production activities in the recipient country. They reveal that the medium and longer term impact of cross-border pollution can lead to reductions in the total amount of emissions by encouraging greater levels of international transfers such as aid. In the same vein,

Niho (NihoY., 1996) examined the effects of international income transfer, such as aid, on the global environmental quality. It is shown that a transfer of resources to a country, whose environmental quality is currently poor, may improve the global level of the environmental quality and benefit not only the recipient but also the donor country, even if the technology of cleanup of pollution is less efficient in the recipient country.

Addison, Mavrotas and McGillivray (Addison, T., G. Mavrotas, and M. McGillivray 2004) suggest that the record on growth (and by extension both pollution and poverty) would have been lower in recent years amongst developing countries, if the amount of official aid had been lower as well. They argue that if environmental quality is a normal good, then poorer countries tend to adopt lower environmental standards. By increasing income in poorer economies, aid can then raise these standards. Since environmental degradation in

many poorer countries can be related to lack of funds for environmental clean-up and preservation, aid has a role to at least decelerate such as degradation. At the same time, aid may have a deleterious impact on the environment in poorer countries if polluters in relatively well-regulated richer countries seek to relocate their operations to low-income countries whose governments may turn a blind eye to environmental transgressions – in return for aid from richer countries – so as to meet their employment and income priorities. However, there is no empirical literature providing a test of their validity through sensitivity, or any other form of quantitative analysis.

B. Mak Arvin, Parviz Dabir-Alai, and Byron Lew (Arvin, B.M. et al., 2006) explore the link between foreign aid and ecological conditions in developing countries using Granger causality test. They suggest the levels of pollution produced by developing countries may be affected by income transfer (such as aid) from richer countries in two ways. On the one hand, these transfers may lead to unsustainable development at an excessive pace, leading to environmental and ecological degradations. A contrary view suggests that these transfers may not only reduce poverty, but encourage greater care of natural resources by the poorer nations.

They explain that some causes of environmental degradation in developing countries obviously have nothing to do with aid. Nonetheless, their study suggests that the contributing effect of aid cannot be ignored. The findings demonstrate that an empirical link between aid and pollution exists in some of the samples. They also suggest the third variable, the debt. Overall, given a developing country's level of external debt, aid has a detrimental impact on pollution. Furthermore, higher emissions prompt donors to provide more aid – a self-perpetuating circular flow between aid and pollution. There can be more significant external variables affect relationship of aid, growth, and the environment. Much more research is required to better clarify the aid impact to economic development and the environment.

Arvin, B.M., Kayani, Z., and Scigliano, M.A. continued study allowing factors such as economic development to be influenced by such aid in the process of simultaneous causation (Arvin, B.M. et al., 2009). They say it is evident that environmental aid has the potential not only to bring better environmental outcomes but also to improve the economic well-being of the citizens of the third world. They investigate whether such aid increases the level of economic development of poorer countries and/or whether this aid is impacted by the level of development of these countries – through an empirical model where aid is determined simultaneously with development. The results suggest that there is a bidirectional nexus between the two variables. This study indicates that environmental aid is positively linked to the degree of industrialization of the country and its environmental need. Clearly, more industrialized developing countries and those with higher water pollution receive more environmental aid.

At the same time, environmental aid is negatively correlated with the level of development of the recipient country as well as its population. As expected, more impoverished countries receive more environmental aid. They explain that it is evident that only two variables are statistically significant: environment aid and degree of globalization – both of which bear a positive relationship to the economic prosperity of a country – as measured by its per capita income. Higher economic development is associated with more environmental aid – which is sensible; and a developing country's increasing involvement in the global economy appears to contribute to its economic well-being.

Buntaine and Parks (Buntaine, M., and Parks , B. 2011) find that the two most important factors predicting the successful implementation of environmental projects are good governance in the borrowing country and less focus on achieving global targets. Figaj (FigajM. 2011) explores what influences the World Bank, the second largest donor (after

Japan) and the largest multilateral donor for environmental sustainability, to allocate aid for environment. The study shows the allocation is influenced by poverty, political, economic and regional variables. Overall, environmental aid is placed within the broader poverty alleviation framework of aid. This paper suggests that environmental aid should have value in itself and be primarily driven by environmental indicators to be more effective and environmental aid efficiently allocated.

2.2. Greening Aid

Green is relatively a new perception in economic development and aid; it is difficult to catch empirical evidence and literatures based on particular terminologies such as green growth and green aid. However, there are few studies discovering relationships among aid, economic development and environment. Recently, Hicks et al. (Parks, B. et al. 2008) made a significant progress realizing the lack of reliable information and limited accountability. Starting from this recognition, they introduce a new trend of aid in green perspective. Even though this study focuses on the aid allocation side, they try to explain the overall pattern of environmental aid by suggesting variables such as a recipient country's level of economic development, population size, colonial history, transparency of environmental policies, and geographical proximity to donors are all positive determinants of environmental aid. They argue aid allocation should be a key observation first because allocation patterns shape the expected effectiveness of environmental aid.

This study brings four major hypotheses: (1) has aid been greened, and if so, by how much?; (2) which donor governments spend the most on foreign assistance for the environment and why?; (3) why do some donor governments delegate responsibility for

allocating and implementing environmental aid to multilateral agencies when they could simply give it away themselves?; (4) and which countries receive the most environmental aid and why?

They explain aid has been generally greened, 370% increase in bilateral environmental aid and 140% in multilateral over the 1980s and 1990s. However, drop in dirty aid is more significant than the rise in environmental aid. Still, environmental aid remains only a small fraction, approximately 10%, of total aid flow. They also find that wealthier and more post-materialist countries invest less in dirty aid, but not necessarily more in environmental aid. Moreover, countries with higher rates of environmental treaty ratification and compliance have larger environmental aid budgets than those have not. In this regard, international environmental treaties which are often being blamed on its effectiveness, such as Kyoto Protocol, at least meant something positive in international environmental development.

Lastly, they suggest there are some factors might affect developing countries who receive more environmental aid than others. For example, they find statistical evidence that some variables such as global environmental significance (natural capital stock), local environmental damage, regional environmental significance, participation in international environmental agreements, and recipient credibility of a recipient country, such as policies and institutions, significantly affect the amount of environmental aid receiving.

In conclusion, this study reveals the limitation of existing macro research on aid effectiveness. They say existing literature focuses on relationship between total aid flows and causally distant or unrelated development outcomes. Therefore, this study suggests that sector-specific and sub-sector specific aid effectiveness research is needed in the future. For

better data availability, it also suggests that PLAID should be more developed to contribute to aid effectiveness research and management.

2.3. Aid Effectiveness – Paris Declaration

Aid effectiveness is the biggest topic in recent development history. Radelet, Clemens, and Bhavnani (Radelet S. et al. 2005) classify that there are three prevailing views on aid: (1) aid has no effect on growth, and may actually undermine growth; (2) aid has a positive relationship with growth on average although not in every country, but with diminishing returns; and (3) aid has a conditional relationship with growth, helping to accelerate growth only under certain circumstances. These interpretations come from the pas aid modality. However, aid has been generally focusing on specific goals based on the major purpose of each project. Due to the characteristic of project, single aid project has difficulty to achieve inclusive development objectives including economic, environmental, and social improvement at the same time.

However, it is often controversial that the relationship between aid and macro-economic results when discussing aid effectiveness that is easy to be over-interpreted or miss-interpreted. However, it is also difficult to measure the sectorial impact of single aid project without clear classification of aid and indicators for the measurement. Therefore, the measurements should be tailored depend on the major purpose of aid. It is why research framework for measurement of green aid effectiveness is critical to increase effectiveness of evaluation.

The Paris Declaration on Aid Effectiveness (OECD, 2005) establishes global commitments for donor and partner countries to support more effective aid in a context of

significant scaling up of aid. The main purpose is to enhance the delivery and management of aid in order to improve its effectiveness. The Paris Declaration is based on the following five main principles: (1) ownership; (2) alignment; (3) harmonization; (4) managing for development results; (5) and mutual accountability.

Some try to adapt implications of the Paris Declaration to environmental sustainability. Shine and Paris (Shine T. and Paris R. 2008) say that evidence to date shows that environmental sustainability has not fared well in the broader aid effectiveness agenda. They point sector-wide approaches tend to overlook environmental issues. It notes that a narrow interpretation of alignment could deter donors from addressing environmental issues where the national political context is not favorable. It suggests a need for stronger capacity for cross-sectorial policy integration, stronger national environment authorities, improved progress monitoring and support for broad stakeholder involvement.

2.4. Towards a Green Economy

The UNEP Green Economy Initiative (UNEP, 2008) provides analytical guideline for policy reforms and sectorial investments to achieve a green transformation of key sectors of the economy. It develops a framework for assessing progress in moving towards a green economy. Towards a Green Economy (UNEP, 2011) demonstrates that the greening of economies is not generally a drag on growth but rather a new engine of growth; that it is a net generator of decent jobs, and that it is also a vital strategy for the elimination of persistent poverty.

The report seeks to motivate policy makers to create the enabling conditions for increased investments in a transition to a green economy. It demonstrates that a transition to a

green economy is possible by investing 2% of global GDP per year (currently about US 1.3 trillion) between now and 2050 in a green transformation of key sectors, including agriculture, buildings, energy, fisheries, forests, manufacturing, tourism, transport, water and waste management. However, it would be possible only if such investments are being spurred by national and international policy reforms.

The report divided the investments for greening economy into three parts: (1) investing in natural capital; (2) investing in energy and resource efficiency; and (3) supporting the transition to a global green economy. According to the study, greening the economy not only generates growth, and in particular gains in natural capital, but it also produces a higher growth in GDP and GDP per capita. A green economy also values and invests in natural capital and should be able to contribute to poverty alleviation at the same time. In a transition to a green economy, UNEP expects new jobs called green jobs will be created, which over time exceed the losses in "brown economy" jobs. They also point that prioritizing government investment and spending in areas that stimulate the greening of economic sectors is on the critical path.

It explains that the scale of financing required for a green economy transition – 2% of global GDP – is substantial, but it is an order of magnitude smaller than annual global investment – about 22% of global GDP in 2009. This amount could be mobilized if there are strong agreement and strategic policies to achieve the green economy. In effect, the movement towards a green economy is actually happening on a scale, at a speed which is never seen before. A green economy is expected to generate as much growth and employment – or more – compared to the current business as usual scenario, and it outperforms economic projections in the medium and long term, while yielding significantly more environmental and social benefits.

2.5. Towards Green Growth

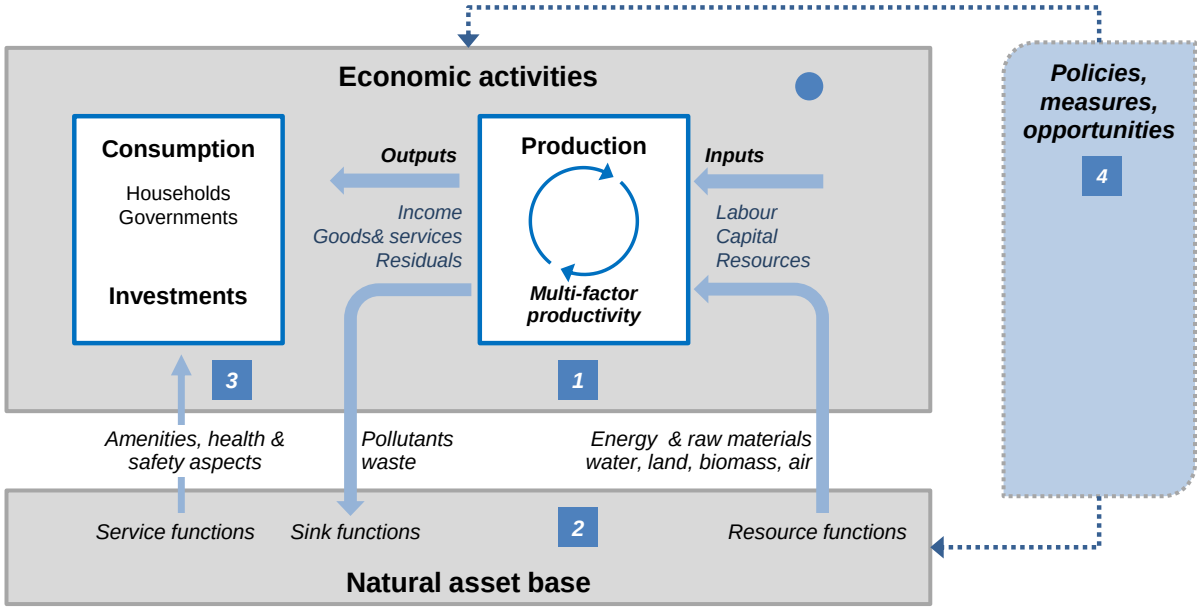
The OECD is one of the utmost sponsors for green growth implementation in support of establishment of policy framework. In one of the recent publications on green growth, they (OECD, Towards Green Growth 2011) define green growth:

> *fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyze investment and innovation which will underpin sustained growth and give rise to new economic opportunities.*

It explains green growth is not a replacement for sustainable development, rather should be considered a subset of it. Green growth is a pathway to sustainable development. It is narrower in scope, entailing an operational policy agenda that can help achieve concrete, measurable progress at the interface of the economy and the environment. Therefore, it provides a strong focus on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth, consistent with resilient ecosystems.

The measurement framework for green growth explores four main inter-related groups of indicators: (1) monitoring the environmental and resource productivity of production and consumption; (2) describing the natural asset base; (3) monitoring the environmental dimension of quality of life and (4) describing policy responses and economic opportunities. They are complemented with generic indicators describing the socio-economic context and characteristics of growth.

Figure 1: Framework for Green Growth Indicators



Source: Towards Green Growth, OECD, 2011

However, not all of the indicators are measureable today. Monitoring green growth requires multi-dimensional approach and sufficient number of data for measurement. This study is on process rather than a final, so further discussion and development is required. Despite the varying nature and lack of measurability, the measurement framework and agenda for green growth give valuable implications for the research framework of green aid effectiveness.

3. RESEARCH METHOD

3.1. Scope

Neither clear definition nor measurement framework for green aid exists so far. However, realizing the lack of previous works is the starting point of this research framework study. This study aims to raise the main question how to evaluate the impact of green aid in the future and to discuss what should be developed for evaluation. Green aid could be defined where certain kind of environmental objectives and expected green effects are.

However, each donor country and institution uses different array of definition depends on situations when categorizing environmental aid. It is particularly because defining the meaning of 'environmental' is not an easy task. All human activities accompany environmental impacts. However, not all the activities have environmental purpose from the beginning. For example, is aid for a dam construction always brown? If not, why? Can aid for human capacity building or institutional set-up being named green? These questions are difficult to be answered since there is no clear definition.

In fact, however, it depends on the objectives and expected outcomes of the dam construction, capacity building, and the institution setting. Defining cause and effect of aid project is becoming more and more complicated to measure than before. In other words, categorizing aid projects is much complex than before that makes the range of green aid even harder to be defined because of relative characteristics and extensive nature of 'green'.

While universally agreed definition on green aid does not exist, this study assumes that green aid is an external (foreign) assistance which supports wide range of activities especially focusing on promoting low carbon green growth in developing countries. The UN

defined low carbon green growth is a system change to turn ecological and resource crisis into economic opportunities (UNESCAP, 2011). The terminology of green aid therefore means aid which promotes the systematic change to turn to green growth in developing countries.

Whereas the idea of green growth may be somewhat abstract and widely applicable, green aid contains specific activities and strategies which should have strong objective as well as expected outcome. Then the outcomes could be measurable where strong measurement framework and criteria are set.

3.2. Methodology

This is an exploratory study to provide a future research framework of aid effectiveness measurement. Literature survey is used to understand previous works and to reveal current status of study. This study, thus, firstly reviews the history of green aid, and then suggests a comprehensive framework based policy frameworks and strategies from leading international organizations in green growth such as the UN organizations, the OECD, and the World Bank. This part is an overview of what have been studied, argued, and developed about green growth strategies so far and to find implications for impact evaluation of green aid. It is not just a summary but refinement of green growth toolkits and its adaptation to aid, which will help the development of an analytical tool.

Additionally, even though data are critically in short, this study tries to explore the empirical evidence of green aid analyzing environmental aid – climate change-related aid – and some other key indicators. The analysis might be broad and insufficient to prove the effectiveness of green aid; however, it shows the minimum level of empirical trend of green

aid as well as current limitations to reveal the necessity of further studies. A lot of research limitations exist at this moment, however, impact evaluation for each aid project is highly expected in future studies. The details for research limitations will be more discussed in the following article.

Empirical analysis requires reliable measurement agenda and data collection. Especially for impact evaluation of aid effectiveness, data collection in recipient country's perspective is more important than that of donor countries. However, compared to the OECD Development Assistance Committee (DAC) countries data, which are easily available through the OECD, data in recipient countries are critically insufficient. The newly established PLAID (Project-Level Aid) is a distinguished database which has very specific categorizing by characteristic of each aid project (AidData 2011).

However, recent data especially after 2000's is not yet available in the PLAID. Since green aid is a relatively new trend of aid flow, analyzing outdated data cannot explain the modality of the recent trend. Therefore this study does not make use of PLAID data but uses the most reliable and updated OECD and the World Bank data in spite of the discordant range of environmental aid which does not fully cover the idea of green aid.

3.3. Research Limitation

Data unavailability due to the absence of clear definition and framework is the major limitation at current level. Surprisingly, despite the importance of measurement framework for the future impact evaluation, only few studies exist on the issue. For such a reason, numerical data under the name of 'green' is not available because of indefinite normative

framework. It is partly because of weak agreement with the explanation of green growth as well as its adaptation to green aid.

Despite former studies from leading international organizations and research institutes, many still argue that the concept of 'green' itself is too abstract. Therefore, clear normative studies should be preceded for further development of measurement framework and indicators for green aid. Sorting existing data in better way is also critical so that future researchers can better analyze the effectiveness of green aid in greater detail.

Furthermore, the relationship between the amount of aid – input – and the degree of impact – effectiveness – is not directly comparable where no standard for the comparison exists. In other words, it is challenging to analyze and compare the output of each aid project in terms of effectiveness since aid effectiveness varies up to its purpose, period, and recipient's and donor's situation. In principle, therefore, precise controlling variables are required for dependable impact evaluation.

For variables control, it is necessary to compare two groups those are in exactly same situation only expect the intervention of aid project to measure accurate impact of the green aid project. For instance, two countries or sectors in the same condition are perfect groups to compare the impact of aid project where aid inflow exists only in a group. In reality, however, it is almost impossible to control all the conditions. It is a common difficulty for impact evaluation not only in green aid effectiveness but in general.

Data reliability is critical condition for the measurement as well. Aid data is often being described greatly different both in donor and recipient countries. A report (Michaelowa A. and Michaelowa K. 2010) reveals that politico-economic factors significantly influence the statistics reported to the DAC. For example, data can be considerably exaggerated by

donor countries' intention where the definition of climate change related activities is in short. In brief, collecting data on green aid is no easy task since aid projects have to be classified specifically according to the purpose.

Time-gap between aid implementation and impact appearance should also be taken into account when analyzing aid effectiveness. Most environmental development projects require long-term perspectives. Therefore, measuring just short-term effects cannot explain the results appropriately. Moreover, green aid is relatively a recent trend of development assistance which has difficulties to demonstrate its effectiveness at this moment. Time-gap also varies depending on each project's characteristic. What is more, green aid is an inclusive idea to support the change of development paradigm which cannot be measured immediately. Therefore, time consideration is necessary for measuring effectiveness and it needs to be standardized for future evaluation.

In spite of all the limitations, research framework and measurement criteria for green aid effectiveness should be urgently developed to better manage aid programs and to increase its effectiveness. Thus, this exploratory study pays attention to explaining the current status as well as limitations to bring discussions and to open future research opportunities.

4. A RESEARCH FRAMEWORK FOR MEASUREMENT OF GREEN AID EFFECTIVENESS

4.1. Approach

Green aid policies are designed to improve the condition of economic growth while ensuring the environmental condition. Thus, green aid targets positive outcomes through economic, environmental, and social condition changes for growth. Policies should be therefore result-oriented and evaluation should be able to explain how much the conditions are changed.

However, there is no measurement framework developed for green aid effectiveness so far. Therefore, this study searches for extensive topics for the measurement, from research criteria to evaluation. It will provide an early opportunity to discuss how to measure green aid effectiveness and how to make use of previous studies for evaluation. In order to do that, comprehensive subjects including measurement framework, data collection, indicators, and monitoring progress will be discussed in this chapter.

Fundamentally, an impact evaluation attempts to answer what the impacts – causal effect – of a program or a policy are. It is essential in order to support evidence-based policies in the future, furthermore to improve the effectiveness of policy implementation. Thus, the evaluation should be able to find out the actual outcome of program and how effective it is. Thereby it gives advice how to improve effectiveness of policies through previous findings of empirical experience.

Estimated impact would be explained from the difference between treated observation and counterfactual analysis. In order to estimate impact of a program,

counterfactual scenario should be estimated as a key for the comparison (Gertler P.J. et al. 2011). The counterfactual is an estimate of what the outcome would have been for a program participant in the absence of the program. In fact, before-and-after and with-and-without comparisons are commonly used for analysis. However, they cannot completely explain the impact because 'why the treated are treated and the others are not' is not considered. Therefore, evaluation needs to ensure the comparability of aid and control groups for measurement.

Above all, again, developing a measurement framework of green aid effectiveness requires a strong definition and scope of green aid. Then it also requires analytical framework to monitor and evaluate the effectiveness. The definition of green growth used here would be represented as low carbon green growth. The terminology of green growth is now generally accepted, it is regarded as a strong policy tool towards sustainable development. For convenience, once again, the definition used here is as follow:

> *Green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyze investment and innovation which will underpin sustained growth and give rise to new economic opportunities.*

For the next steps, relevant data collection and indicators for measurement should be following in order to capture the empirical evidence of impact. Qualitative data are key supplement because they demonstrate quantity of outcome produced. However, quality data collection is not easy and aid effectiveness is not easily captured by a single indicator. Therefore exact direction and technical skills for quality data collection is required. In addition, a set of good indicators should be carefully selected. The principles of data collection and indicator selection should focus on how to evaluate the progress of

development condition towards low carbon green growth in developing countries. Technical details for data collection and selecting indicators will be more discussed later in this chapter.

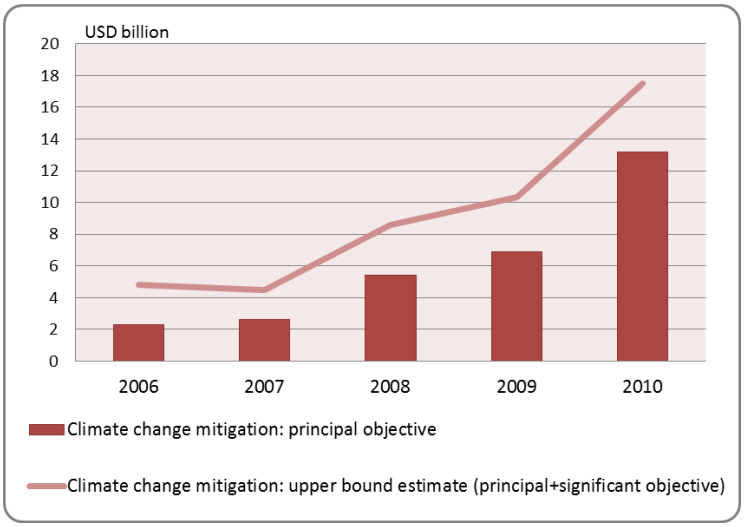
4.2. Measurement Framework

Measuring green aid effectiveness requires good understanding of green growth. Green growth approach is integrating economic and environmental policies for sustainable development. In evaluation of green aid, the main idea is therefore whether the aid helps harmonization between growth and environment. By its nature, framework of green aid is basically combining green growth framework with aid effectiveness perspectives. However, the effectiveness cannot be easily measured due to the limitations discussed above. Aid effectiveness with particular purpose, such as environmental purpose, does not mean that it could be measured by single indicator with particular perspective. Instead, it requires multi-dimensional analysis with various perspectives including but not limited to economic, environmental and social considerations.

The first group of indicators for the measurement is about socio-economic development which explains how aid facilitates the economy in terms of growth. Green economy – an economy of low carbon green growth – can be achieved where energy efficiency is increased or production becomes less energy intensive. In the production side of the economy, growth can be simply measured by GDP indicators. On the other hand, green growth considers social impacts of the economic activities. Therefore, not only economic productivity but also qualitative impact should be taken into account. The combination of indicators including GDP, quality of life, level of inequality, and human development would allow investigating the socio-economic impact of green aid.

Another dimension is environmental consideration. Low carbon green growth is a growth pattern which minimizes negative environmental effects while pursuing growth. Therefore, a set of environmental indicators must be taken into account for measuring aid effectiveness. It is divided into two fragments in this study; climate change related and natural assets. Climate change response is a particularly significant fragment for green growth. Aid framework for climate change mitigation has developed by the OECD in collaboration with the UNFCCC, which is called Rio marker. It is found that estimated USD 17.6 billion is used for climate change mitigation in 2010, which is incremental year by year (OECD, 2011).

Figure 2: Trends in Climate Change Mitigation-Related Aid



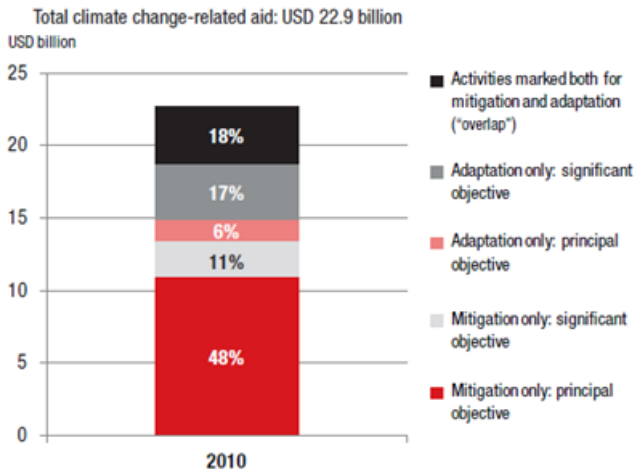
2006-2010, bilateral commitments, USD billion, constant 2009 prices

Source: OECD Development Assistance Committee – CRS, Rio Markers series

Furthermore, recently a new marker to tracking aid in support of climate change adaptation was added. New data show that the member countries of the OECD DAC allocated up to USD 22.9 billion, or 15% of total official development assistance (ODA), to climate change mitigation and adaptation in developing countries in 2010 (OECD, 2011). Even though the range of climate change-related aid cannot fully cover that of green aid, it is

still significant since fight for climate change is one of the biggest objectives what green aid aims.

Figure 3: Total Climate Change-Related Aid in 2010



Bilateral commitments, USD billion, current prices

Source: OECD Development Assistance Committee – CRS, Rio Markers series

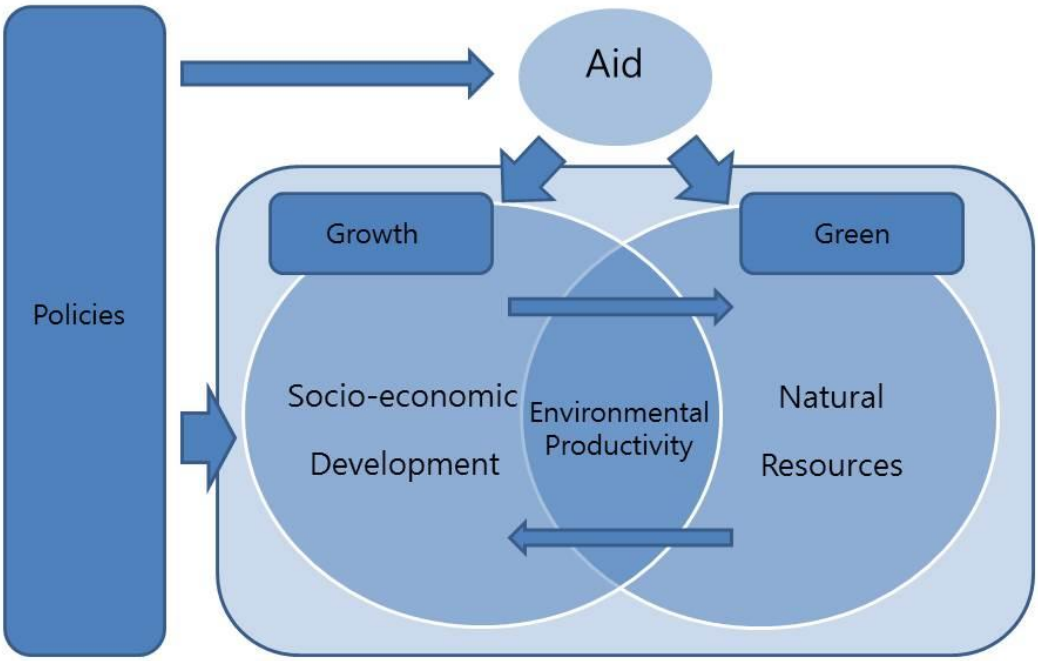
Another fragment of environmental considerations is natural assets and environmental quality. Most environmental aids aim to enhance the environmental sustainability by keeping quality of environmental assets and natural resources. These activities affect the socio-economic dimension directly and indirectly. From green growth perspective, it is important to understand that natural asset is critical for economic growth and development. For instance, the environmental quality significantly affects health and education, which are fundamental conditions for economic growth.

Energy is the central indicator of measurement for green aid effectiveness. Energy resources come from natural assets and it becomes resource for growth again. Green growth

could be explained as a model of economic system that of less energy intensive or higher energy efficient. That is the reason why most green technologies are focusing on renewable and clean energy development.

Lastly, policy response of recipient countries is an important impact of green aid. Green aid aims to induce policy change into environment-friendly ways. Policy change can critically affect the whole framework. For instance, innovation and technology development are not just results of the aid but also significant potential catalysts towards low carbon green growth creating new economic opportunities.

Figure 4: Framework for Measurement of Green Aid Effectiveness



Source: Author

4.3. Data Collection

Once the measurement framework is outlined, the next consideration is to determine what kind of data is needed and how to collect it. In most cases, a collection of new data is required for evaluation of green aid. Then sample should be selected to precisely estimate differences of outcomes between the treatment group and the comparison group. As stated in the above chapter for research limitations, however, it is not an easy task to control all variables. For a precise impact evaluation, theatrically, all other conditions should be the same only expect the aid intervention. Therefore, comparing two countries – a country having green aid and the other not – is not enough creditable. Because two countries would never be in the same condition and not all other variables could be controlled. Therefore samples should be comparable as much as specific and in-depth.

The quality of impact evaluation depends on the quality of the data based on. Even though not all variables can be completely controlled, appropriate data control increases credibility of the estimation. Therefore quality data control should reflect reality of the population because the sample data is representative of the entire population. Accountable sample selected makes real-time and informed decisions for policy makers and analysts. Thus, evaluation requires being scoped-down in specific subject. Green growth is a whole development system change into the sustainable way; therefore green aid evaluation should focus on the results of its targeted purpose rather than aggregate scale.

Generally, data shortage is the prevalent obstacle for impact evaluation. Although it is the key component, available data is often very limited. Appropriate measurement of green aid effectiveness involves various approaches therefore wide range of data is required. However, data is insufficient and the quality is often poor especially in developing countries.

It is frequently because of lack of statistical system, which is a big challenge should be complemented so that collected data can reflect reality into the evaluation.

Besides, environmental data collection is particularly difficult since environmental indicators are generally hard to be measured without continuous observation. For instance, many environmental aid projects consider the movement of total CO2 emission. It is however a result of entire economic activities in a country which cannot be simply explained through couple of indicators. Furthermore, measuring output of environmental aid is often limited because not all environmental aid aims tangible targets such as CO2 emission.

The European Commission (CommissionEuropean 2006) says there are number of difficulties in calculating the precise amount of environmental expenditure because there is no generally accepted definition of an environmental project. The idea of green is even more challenging to be calculated since the range of green would vary depends on situations. Therefore generally acceptable definition of green aid is needed so that future researchers can measure and compare the result of each project more precisely.

Meanwhile, in many cases, project evaluation relies on survey methodology. If it is the case, independent evaluation institution or group should take responsibility of the entire evaluation process. Otherwise, survey oriented evaluation has a danger of being manipulated. Therefore evaluation should be aware of the risk from data manipulation. The Intergovernmental Panel on Climate Change warns data are simply not collected and analyzed in a manner that informs policy makers interested in the issue (Intergovernmental Panel on Climate Change 2011). Therefore evaluators require neutrality for data collection; otherwise the results could be easily counterfeited by any purpose of the evaluation.

Lastly, as stated, time-gap between implementation and outcome appearance should be also considered in evaluation. Green aid is often being described as a short-term cost and long-term benefit. Thus, the impact of green aid appears with time-gap, it is therefore impetuous to measure the effectiveness without time consideration especially when it comes to a project with the long term low carbon green growth approach. For precise measurement, evaluation requires both short-term and the long-term perspectives. Therefore, periodical evaluation is important to observe not only the final impact but also intermediate impact.

4.4. Indicators

Selecting appropriate indicators is an essential part of trustworthy evaluation. Enhancing accountability of impact evaluation requires applicable set of indicators which should be developed as specific, measurable, and attributable as possible. Most existing green growth indicators explore the relationship between economic growth and the environment. The interpretation of green aid impact is therefore inclusive with multi-dimensional approaches including socio-economic development, environment and resources, natural resources, as well as policy responses.

Recently, the OECD proposed a set of indicators for green growth monitoring progress (OECD 2011). Monitoring green aid is about measuring how much the aid promotes low carbon green growth in developing countries. Therefore, green growth indicators are indispensable to monitor the impact of green aid. This section selects a set of key indicators which should be considered for evaluation of green aid effectiveness in the future. This proposal is a point of departure for further discussion rather than a fixed.

4.4.1. Socio-economic Development

Measuring effectiveness of green aid primarily explores the socio-economic context. The dimension might be explained through observing the degree of economic growth, productivity change, labor market condition, as well as degree of social development. These observations, however, rarely explain environmental implication such as carbon intensity. Nevertheless, socio-economic development is still the key observation because it is the fundamental aspect for green growth strategies.

Economic growth can be relatively easily captured by GDP indicators. In general, GDP is the most widely used indicator measuring the output of economic activities in terms of growth. However, the evaluation should also be exclusive from economic externalities such as inflation effects and commodity price change. Besides, the gross-level measurement does not imply the economic productivity which is the key source of economic growth and competitiveness. Productivity increase is the main strategy for green growth, so proper indicators measuring the productivity change should be supplemented.

Labor and multifactor productivity could explain national and industrial productivity conditions. Because the calculation of labor productivity is often based on GDP per hours worked, employment and labor market is another important aspect for low carbon green growth strategies. Green job creation arisen from aid is a key indicator to explain changes of labor market condition.

On the other hand, other social indicators such as poverty ratio and education level help to measure social effects of aid. These indicators are important contributors for impact evaluation because many social indicators are directly related to economic productivity within growth dimension. In fact, continuous social and labor market conditions are difficult

to observe in developing countries. For data quality and better measurability, constant observation of social changes and statistical supports to developing countries are highly required.

4.4.2. Environment and Resources

The socio-economic development is the key dimension for green aid evaluation, however, it does not imply how 'green' the impact is. Therefore an independent set of indicators which are able to measure green impact on environment and resource efficiency is required. The central element of green growth is the environmental and resource efficiency while ensuring growth. The following group of indicators enables to measure the green impact – environmental and resource productivity. This group of indicators would allow investigating the capacity change for environmental sustainability throughout green aid implementation. The observation mainly depends on degree of carbon, energy, and other resources productivity of the economy.

One of major challenges of green aid is response to the climate change. Increasing resilience of the economy to the climate change is an essential objective which could be interpreted as low carbon green growth. Therefore carbon and energy productivity are key index for the green impact evaluation. Total amount of CO2 and other GHG emissions support the impact of green aid to climate change mitigation. Even though aggregate emission may not be affected by single aid project, however, it is still meaningful to observe overall relationship between green aid and climate change mitigation in the long term perspective. Average temperature change, frequency of natural disasters, and waste

generation are climate change related indicators which will be able to explain the carbon intensity of economy.

Productivity indicators are useful to measuring efficiency change of the economy. Energy productivity is one of the key subjects towards low carbon green growth. Energy productivity increase can be achieved by decrease of energy intensity or increase of energy efficiency. Therefore, energy productivity is closely related to eco-efficiency of the economy. It is not only important in production or consumption side, but also in policy result for low carbon technologies such as renewable energy and clean energy. It is clear that renewable energy is becoming more and more important for sustainable development. Therefore share of renewable energy in the entire energy supply would be a valuable indicator to see the whole economic sustainability. Additionally, other resource productivity including, but not limited to, agricultural, water, and material productivity could also capture the impact of the green aid.

4.4.3. Natural Resources

Natural resources are major asset of economic activity and human welfare. Natural resources such as air, water, land, raw materials, and energy are essential ingredients of human life and development. However they are limited, adequate use and management of natural resources is significant for sustainable development. Preserving natural capital and ensuring environmental sustainability is therefore a key strategy of green growth. Consequently, green aid has to target the optimal use and management of natural assets.

There are various ways that environmental condition affects the quality of life and economic and social development. For example, low environmental quality worsens overall

health status and quality of life that causes labor productivity decrease. It may also affect climate change and natural disasters which significantly affect a country's economy. As the world has experienced, developing countries are the most vulnerable to the negative impact of climate change. In short, environmental condition could substantially affect the entire development aspect in a country.

Natural resources are often more important in developing countries since natural capital is key resource for economic activities for many developing countries. Sufficient natural resources are necessary at the early stage of development because least developed countries highly rely on primary industry such as agricultural, forestry, and fishery. Therefore natural resources such as forest, land, freshwater, and soil are key indicators to monitor the sustainability of economy. Environmental condition is a critical constituent not only for human well-being but also for economic activities which are organically linked altogether.

In fact, traditional environmental aids more directly aimed to enhance the environmental conditions and natural resource management rather than other dimensions such as socio-economic development and environmental and resource productivity. It could have more tangible outcomes since the objectives are clearer. However, green aid is considering growth and productivity dimensions at the same time which is relatively a new paradigm of development assistance. By its nature of green aid, there are not only opportunities but challenges such as difficulties in delivering the aid objectives.

Data regarding environmental impact of each aid program is however rarely available. It is difficult to measure the environmental impact of each development project because available environmental data often exists only in aggregate. Therefore, more work is needed to build longer time database and to improve international comparability of data.

Likewise, comparison studies with business-as-usual scenario will show more precise impact of aid program if data is available.

4.4.4. Policy Responses

Policies not only lead initial design of aid but also substantially affect the entire framework of green growth. In fact, all impact dimensions of green aid are organically connected to each other. In this regard, policies should be also taken into account as a key indicator group for the effectiveness evaluation. Evaluation of policy response is important because new opportunities arisen from green aid will function as positive driving force for green growth. However, the process will vary up to the context of countries so the monitoring progress should be independent and country-specific.

Green growth is about change the growth pattern into more sustainable way. In other words, it is about enhancing economic productivity while minimizing negative environmental impact. Ideally, public-private cooperation is therefore a key element for promotion of low carbon green growth. Government has initial role to set targets and strategies towards green economy in the context of a country's situation. Then the role of market and business is important carrying out R&D and innovation for developing and using green technologies and products. Therefore close partnership between the public and the private is required to leap to green economy and to create new opportunities including market and employment.

Green investment is an important determinant for green growth. Indicators such as R&D expenditure on green growth and GDP expenditure for environmental preservation show the level of green investment in a country. In fact, financing is a key source for low carbon green growth which often means taxation – regulations. Appropriate regulations help

inducing the economy to low carbon economy because market itself cannot achieve green growth. Therefore, green taxation (environmental related taxation), which is major source of green growth, explains the degree of greening the economy. Price structure of products is also important indicator to monitor the progress. Indicators such as level of green pricing and share of environmental taxes in price enable to analyze if the price structure rational in terms of environmental sustainability.

Institutional innovation also contributes to various aspects of green growth progress. However, it is not easily measurable. Greening growth needs long term strategies therefore an authoritative institution which monitors consistency and its implementation is necessary. In this regard, institutional set-up and structural change can partly demonstrate the level of institutional innovation in recipient countries. It is particularly important at the early stage of implementation of green aid. If green aid assists the institutional progress, impact evaluation also should be able to monitor and assess the entire progress.

4.5. Monitoring and Evaluation

Impact evaluation should be result-oriented. Therefore assessing the results has to be effectiveness-oriented rather than simply input-outcome comparison. For effective evaluation, the whole process from policy design to evaluation needs to be organically connected. Monitoring is a continuous process of collecting and analyzing information to track implementation and program management. It is a useful tool to watch and manage the implementation process of a program whereas evaluation is a systematic and objective assessment of on-going or completed project.

Evaluation is an analytical activity which affects decision-making process through the lessons learned from it. Eventually, impact evaluation is an assessment of the causal effect of a program, project or policy on beneficiaries. Therefore it should be able to compare the state of the beneficiaries with and without the development intervention and to determine intermediate or final outcomes attributable to the intervention (Gertler P.J. et al. 2011).

Monitoring and evaluation of development policies require long-term approaches. In order to secure continuity of policy implementation, independent monitoring institution is recommended to be in charge of the progress for transparency and effectiveness of program. Post evaluation and analysis is also significant because it will provide substantial suggestions for further improvement of similar aid programs in the future.

5. EMPIRICAL ANALYSIS

This chapter explores empirical evidence of green aid. In fact, data are critically in short that makes difficult to directly compare the relationship between green aid and its impact. In other words, accurate empirical analysis between aid and the proposed indicators is rarely possible due to the research limitations at current level of study. Moreover, measuring green aid effectiveness is too early because green aid is still at the early stage of the implementation. However, this chapter tries to find out the least level of evidence or relationship to understand the movement of green aid and the tendency of selected variables.

The OECD provides various aid categories depends on its types, sectorial approaches, policy objectives as well as “Rio markers”. Since 1998 the DAC has monitored aid targeting the objectives of the Rio Conventions through its "Creditor Reporting System" (CRS) using the so called "Rio markers". Rio markers have four specified categories: (1) biodiversity-related aid; (2) desertification-related aid; (3) climate change mitigation-related aid; and (4) climate change adaptation-related aid. This chapter uses climate change mitigation-related aid among Rio markers to determine the scale of green aid. Rio markers cannot cover the entire scope of green aid; however, it provides the most specified and reliable aid data for climate change related classification.

Selected five recipient countries for the analysis are Cambodia, Indonesia, Philippines, Thailand, and Vietnam. These ASEAN countries share many similarities including the recent remarkable economic growth. At the same time, these countries are well known as vulnerable to climate change. The Indonesian tsunami in 2004 was the extreme

negative impact of climate change which proved the vulnerability of developing countries to the impact of climate change.

Climate Risk Index (CRI) (Germanwatch 2012) analyzes to what extent countries have been affected by the impacts of weather-related loss events such as storms, floods, heat waves and etc. Among the 5 ASEAN countries, Vietnam and the Philippines have been considered as the most vulnerable countries to the impacts of climate change. However, the modality of climate change-related aid allocation has shown a lot difference with the level of vulnerability. For the last decade, for example, the Philippines was the second smallest recipient of climate change-related aid and while it is the second most vulnerable country.

Table 1: Climate Risk Index

Year	2011	2010	2009	2008	2007	1998-2007
Cambodia	37	39	7	116	99	25
Indonesia	47	41	29	39	13	17
Philippines	10	14	3	4	44	10
Thailand	55	13	34	35	63	45
Vietnam	6	19	4	3	8	6

Source: Climate Risk Index (CRI). http://germanwatch.org/.

Many previous studies tried to demonstrate determinants of green aid allocation. This chapter however aims to see the movement of green aid and key indicators for low carbon green growth, such as CO2 emission and productivity. Due to the lack of environmental data and difficulties in controlling variables, discovering the direct relationship between green aid and its impact, such as change of CO2 emission, is challenging. However, following data will

briefly demonstrate the stream of climate change-related aid and key variables related to climate change in selected countries.

Generally, CO2 emission grows as the economy grows. Therefore, lesser CO2 emission does not always mean greener economy. Rather, CO2 productivity is the essential indicator to measure eco-efficiency of the economy. Likewise many social indicators such as mortality rate and Human Development Indicator (HDI) improve as the level of income grows. It is therefore difficult to conclude that there is positive impact of green aid where the social indicators improve. In fact, regression analysis does not find strong relationship between climate change-related aid and environmental indicators such as CO2 emission. It is partly because the aid amount is relatively too small to change the environmental status in aggregate. Another reason could be that green aid takes longer time to harvest its outcome.

In the case of Vietnam, the second biggest climate change-related aid recipient, total CO2 emission has been almost tripled while its GDP has been doubled. Energy productivity, used energy use per $10,000 GDP here, has not been much improved in the same period. On the other hand in Cambodia, the smallest aid recipient among the five countries, GDP has 2.5 times grown while total CO2 emission has been doubled. In the case of Indonesia, the biggest climate change mitigation-related aid recipient, total CO2 emission has been doubled for the last decade while the economy has been doubled. The CO2 productivity has been rarely improved while energy use has been increased.

Finally, it is challenging to conclude that climate change mitigation-related aid has critically affected the level of mitigation or the level of CO2 intensity in developing countries. It is possibly because aggregate data such as total GDP or total CO2 emission has too many factors so that it could not be explained by any single factor. However, the analysis provides potential implications: (1) climate change mitigation-related aid has not effectively delivered

to developing countries; (2) the amount of aid is not enough to improve the current status of developing countries; (3) it is difficult to prove the effectiveness due to the limited data and difficulties in variables control; and/or (4) analysis in aggregate does not explain the aid effectiveness but it should be project-based monitoring and evaluation.

Table 2: Climate Change Mitigation-Related Aid in Selected Countries

Rio Markers	Only Climate Change												
Amount	Commitments (constant 2009 USD millions)												
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Cambodia	0.01	6.25	0.48	..	..	52.88	2.01	2.39	2.67	0.12	6.99	43.83	117.64
Indonesia	23.41	21.60	0.01	12.34	5.25	1250.28	786.27	423.45	356.11	300.55	587.76	1164.34	4931.37
Philippines	1.84	78.20	9.50	3.32	58.35	43.53	14.72	18.78	1.08	76.74	270.19	58.28	634.52
Thailand	3.15	0.78	0.72	9.61	2.04	19.92	0.33	3.03	2.07	1.48	663.56	683.13	1389.82
Vietnam	7.25	7.21	0.18	106.80	333.69	70.24	322.95	16.58	27.86	394.66	99.01	538.21	1924.64
Total	**35.65**	**114.04**	**10.89**	**132.08**	**399.33**	**1436.85**	**1126.28**	**464.22**	**389.79**	**773.54**	**1627.52**	**2487.78**	**8997.98**

Source: OECD CRS Database. 2012. http://stats.oecd.org/.

Table 3: Selected Indicators in Cambodia

Country	**Cambodia**										
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (constant 2000 billion US$)	3.0	3.4	3.7	4.0	4.2	4.6	5.0	5.7	6.3	7.0	7.4
GNI per capita (constant 2000 US$)	239	264	284	302	321	341	372	419	457	499	532
CO2 emissions (kt)	2233	2197	2255	2644	2860	3128	3498	3722	4074	4441	4602
CO2 emissions (metric tons per capita)	0.186	0.180	0.181	0.209	0.223	0.240	0.265	0.279	0.301	0.325	0.333
CO2 emissions (kg per PPP $ of GDP)	0.247	0.214	0.197	0.209	0.209	0.206	0.203	0.185	0.177	0.170	0.162
CO2 emissions (kg per 2005 PPP $ of GDP)	0.211	0.185	0.175	0.190	0.193	0.194	0.197	0.185	0.183	0.181	0.175
Mortality rate, under-5 (per 1,000)	114.6	108.7	103.1	96.2	89.8	83.8	78.2	72.7	67.8	62.8	58.5
School enrollment, secondary (% gross)	17.93	15.58	16.59	18.63	22.66	27.09	30.70		38.75	41.73	44.33
Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP)	360.38	328.18	308.65	299.06	289.15	275.39	259.93	236.12	221.13	207.54	197.92
GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	2.77	3.05	3.24	3.34	3.46	3.63	3.85	4.24	4.52	4.82	5.05
Labor participation rate, total (% of total population ages 15+)	79.7	79.6	79.6	79.8	80.1	80.4	80.7	79.9	79.3	78.7	78.5

Source: The World Bank Data. 2012. http://data.worldbank.org/.

Table 4: Selected Indicators in Indonesia

Country	**Indonesia**										
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (constant 2000 billion US$)	156.1	157.3	162.0	171.0	178.7	187.3	196.7	207.9	219.3	233.2	247.3
GNI per capita (constant 2000 US$)	679	686	704	701	717	748	781	817	848	890	928
CO2 emissions (kt)	210211	237596	258120	289066	303507	311886	333734	336312	338134	368618	406029
CO2 emissions (metric tons per capita)	1.011	1.128	1.210	1.337	1.386	1.406	1.486	1.480	1.471	1.586	1.728
CO2 emissions (kg per PPP $ of GDP)	0.464	0.513	0.520	0.550	0.543	0.522	0.517	0.477	0.440	0.438	0.446
CO2 emissions (kg per 2005 PPP $ of GDP)	0.397	0.445	0.461	0.498	0.501	0.491	0.500	0.477	0.455	0.466	0.484
Mortality rate, under-5 (per 1,000)	58.8	56.3	54	51.7	49.5	47.5	45.5	43.7	41.9	40.3	38.5
School enrollment, secondary (% gross)			52.81	54.98	56.41	59.52	61.71	60.64	63.89	71.50	70.18
Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP)	266.85	286.58	278.15	275.80	274.64	262.67	267.69	257.22	252.35	238.02	228.68
GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	3.75	3.49	3.60	3.63	3.64	3.81	3.74	3.89	3.96	4.20	4.37
Labor participation rate, total (% of total population ages 15+)	65.4	67.9	67.8	67.6	67.4	67.7	68	68.2	68.3	68.3	68.3

Source: The World Bank Data. 2012. http://data.worldbank.org/.

Table 5: Selected Indicators in Philippines

Country	**Philippines**										
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (constant 2000 billion US$)	75.3	77.6	81.0	83.4	86.4	90.7	96.8	101.4	106.7	113.8	118.5
GNI per capita (constant 2000 US$)	931	1038	1048	1056	1077	1105	1153	1188	1237	1290	1312
CO2 emissions (kt)	75650	73021	79112	77165	76057	76244	78998	81066	67630	78580	83157
CO2 emissions (metric tons per capita)	1.022	0.965	1.023	0.977	0.943	0.926	0.941	0.948	0.776	0.886	0.922
CO2 emissions (kg per PPP $ of GDP)	0.457	0.421	0.428	0.397	0.371	0.347	0.328	0.311	0.238	0.252	0.251
CO2 emissions (kg per 2005 PPP $ of GDP)	0.390	0.366	0.379	0.360	0.342	0.327	0.317	0.311	0.246	0.268	0.273
Mortality rate, under-5 (per 1,000)	43.1	41.8	40.4	39.2	37.8	36.7	35.6	34.5	33.4	32.4	31.3
School enrollment, secondary (% gross)	74.49	74.30		75.05	79.66	81.86	83.96	83.54	81.91	81.90	82.72
Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP)	196.51	195.49	193.84	180.72	176.72	168.71	157.19	150.12	141.44	130.25	129.85
GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	5.09	5.12	5.16	5.53	5.66	5.93	6.36	6.66	7.07	7.68	7.70
Labor participation rate, total (% of total population ages 15+)	66.7	66.4	65.1	66.6	66.4	66.2	65.7	64.5	63.8	63.6	63.8

Source: The World Bank Data. 2012. http://data.worldbank.org/.

Table 6: Selected Indicators in Thailand

Country	**Thailand**										
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (constant 2000 billion US$)	112.2	117.2	122.7	125.4	132.1	141.5	150.5	157.4	165.4	173.7	178.1
GNI per capita (constant 2000 US$)	1826	1869	1913	1949	2045	2179	2301	2388	2471	2570	2610
CO2 emissions (kt)	186504	196947	201549	217086	230636	245674	267761	275164	283987	282091	285733
CO2 emissions (metric tons per capita)	3.025	3.156	3.191	3.397	3.568	3.758	4.053	4.125	4.221	4.161	4.185
CO2 emissions (kg per PPP $ of GDP)	0.687	0.685	0.655	0.675	0.670	0.652	0.650	0.618	0.588	0.540	0.522
CO2 emissions (kg per 2005 PPP $ of GDP)	0.588	0.594	0.581	0.612	0.617	0.614	0.629	0.618	0.607	0.574	0.567
Mortality rate, under-5 (per 1,000)	18.6	18.2	17.7	17	16.5	16.1	15.5	15.1	14.9	14.3	13.9
School enrollment, secondary (% gross)	61.34			62.21	63.92	64.01	66.29	70.90	71.01	75.49	74.98
Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP)	208.30	212.91	208.47	214.09	217.27	219.21	222.39	215.67	209.85	207.96	211.06
GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	4.80	4.70	4.80	4.67	4.60	4.56	4.50	4.64	4.77	4.81	4.74
Labor participation rate, total (% of total population ages 15+)	74.2	73.1	73.5	73.7	73.5	73.3	73.4	73.4	72.8	73.2	73.2

Source: The World Bank Data. 2012. http://data.worldbank.org/.

Table 7: Selected Indicators in Vietnam

Country	Vietnam										
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP (constant 2000 billion US$)	27.9	29.2	31.2	33.3	35.7	383.3	41.3	44.8	48.5	52.6	55.9
GNI per capita (constant 2000 US$)	365	375	396	417	443	470	502	539	579	625	659
CO2 emissions (kt)	47781	48027	53582	61631	71349	79438	101679	104084	83736	112291	127384
CO2 emissions (metric tons per capita)	0.633	0.627	0.690	0.784	0.897	0.987	1.249	1.263	1.005	1.333	1.496
CO2 emissions (kg per PPP $ of GDP)	0.504	0.477	0.488	0.513	0.546	0.554	0.640	0.584	0.421	0.505	0.528
CO2 emissions (kg per 2005 PPP $ of GDP)	0.431	0.414	0.432	0.465	0.503	0.521	0.619	0.584	0.434	0.537	0.573
Mortality rate, under-5 (per 1,000)	38	36.4	35	33.7	32.3	31.1	29.9	28.5	27.4	26.3	25.2
School enrollment, secondary (% gross)	57.12	60.75	64.00	66.38	69.21	72.47	74.62	77.09	77.49	77.73	77.21
Energy use (kg of oil equivalent) per $1,000 GDP (constant 2005 PPP)	322.14	307.22	297.79	293.70	296.09	287.10	302.52	286.13	271.94	267.97	266.18
GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	3.10	3.26	3.36	3.40	3.38	3.48	3.31	3.49	3.68	3.73	3.76
Labor participation rate, total (% of total population ages 15+)	74.7	74.6	73.3	74	73.5	73.2	72.6	72.3	72.2	72	72

Source: The World Bank Data. 2012. http://data.worldbank.org/.

6. CONCLUSION

Green aid creates abundant potentials delivering low carbon green growth in developing countries and positive impact to pursuing more sustainable way of development. However the effectiveness has not been proved yet, further discussion and research is necessary to enhance the effectiveness of delivery. Achieving green growth is however very challenging, it requires higher degree of cooperation among various stakeholders including the government, the market, and the private as well as individuals. Eventually, green economy can be achieved where production and consumption pattern are changed into sustainable way. Towards green economy, green growth is a pathway which facilitates positive changes and green aid is expected to assist the changes for developing countries which have relatively lower capacity but greater possibilities.

International green cooperation is still at the very early stage. The international society is however putting unprecedented attention and planning to expend huge amount of budget for further cooperation. Establishment of international green partnership such as Global Green Growth Institute (GGGI) and Green Climate Fund (GCF) is already remarkable accomplishment to move towards the next step. Furthermore, institutions such as the UN and the OECD have been working on green policy framework, sectorial strategy, indicators, as well as monitoring progress. A clear fact is that global green financing and development cooperation will be continuously increasing and strengthened.

However, lack of framework is still big challenge for developing and promoting green growth throughout the world. Particularly, impact evaluation for green aid has been rarely discussed so far even though it is a critical condition for understanding and improvement of

green aid policy. Impact evaluation is essential for effectively managing development programs and monitoring the progress in the future. Eventually, it will significantly enhance not only effectiveness but also further international consultation for spread of green growth worldwide.

The issues addressed here will require substantial research in the future. In the long run, success of green aid policy depends on well-defined framework and a set of economic and environmental policy criteria. Green aid policy may face challenges to be circulating all across the sectors without high level of coordination among various stakeholders. However, green aid will play a crucial for developing countries in effort to ensuring environmental protection and economic growth simultaneously. Therefore delivering green aid requires good understanding of the determinants of aid effectiveness, careful and complete analysis of aid and its environmental impacts.

APPENDIX

APPENDIX A

Ten Principles for Improving the Environmental Performance of Aid Agencies

1. Environmental aid planning and allocation cannot be done outside of national development planning in recipient countries. Development and environmental planning need to be integrated.
2. The transfer of environmental assistance should be conceived of as a cooperative contract that implies mutual policy adjustment by both donor and recipient. Asking recipient governments to unilaterally clean up the environment and enforce new regulations without some compensation is unrealistic. Similarly, asking donors to allocate resources to developing countries without credible guarantees that recipients will alter their behavior is equally unrealistic.
3. Recipients of environmental assistance that actively address global environmental issues through planning, regulation, public education, or remediation should be rewarded with other types of aid that are more highly valued by the recipient government.
4. If recipient countries are going to transition to less pollution-intensive development pathways, then donor countries must recognize the political consequences of such economic changes and design aid programs to compensate firms, individuals, and groups who suffer as a consequence of these environmental reforms.
5. Aid allocations should be based on scientific assessments of environmental need as much as possible.
6. Environmental aid should be directed to areas where it is likely to be most effective.

7. Tied aid should be reduced or eliminated because it reduces the environmental rate of return on donor investments by artificially restricting competition for goods and services purchased with aid dollars.
8. Donor coordination requires better information on allocation and effectiveness. Specifically, the development community needs a single database that covers all donors (OECD bilateral donors, multilateral donors, emerging donors, and, ideally, private donors). The current data system is not sufficient for coordination in the data and non-uniform standards for classifying different types of assistance.
9. Recipient countries must have greater say in the allocation of environmental aid.
10. Recipient governments and local groups within developing countries need to participate more in the planning and execution of aid projects. If recipients lack a sense of ownership, then the likely effectiveness of the project will be reduced.

APPENDIX B

Definition of the Rio Marker on Climate Change (Mitigation)

Extract from the CRS Directives

AID TARGETING THE OBJECTIVES OF THE FRAMEWORK CONVENTION ON CLIMATE CHANGE MITIGATION	
DEFINITION	
An activity should be classified as climate-change-related (score Principal or Significant) if:	It contributes to the objective of stabilisation of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration.
CRITERIA FOR ELIGIBILITY	The activity contributes to a) the mitigation of climate change by limiting anthropogenic emissions of GHGs, including gases regulated by the Montreal Protocol; **or** b) the protection and/or enhancement of GHG sinks and reservoirs; **or** c) the integration of climate change concerns with the recipient countries' development objectives through institution building, capacity development, strengthening the regulatory and policy framework, or research; **or** d) developing countries' efforts to meet their obligations under the Convention. The activity will score "**principal objective**" if it directly and explicitly aims to achieve one or more of the above four criteria.
EXAMPLES OF TYPICAL ACTIVITIES	
1. Typical activities take place in the sectors of: Water and sanitation Transport Energy Agriculture Forestry Industry	• GHG emission reductions or stabilisation in the energy, transport, industry and agricultural sectors through application of new and renewable forms of energy, measures to improve the energy efficiency of existing generators, machines and equipment, or demand side management. • Methane emission reductions through waste management or sewage treatment. • Development, transfer and promotion of technologies and know-how as well as building of capacities that control, reduce or prevent anthropogenic emissions of GHGs, in particular in waste management, transport, energy, agriculture and industry. • Protection and enhancement of sinks and reservoirs of GHGs through sustainable forest management, afforestation and reforestation, rehabilitation of areas affected by drought and desertification.
2. Typical non-sector specific activities are: Environmental policy and administrative management Biosphere protection Biodiversity Env. education/training Environmental research	• Protection and enhancement of sinks and reservoirs through sustainable management and conservation of oceans and other marine and coastal ecosystems, wetlands, wilderness areas and other ecosystems. • Preparation of national inventories of greenhouse gases (emissions by sources and removals by sinks); climate change related policy and economic analysis and instruments, including national plans to mitigate climate change; development of climate-change-related legislation; climate technology needs surveys and assessments; institutional capacity building. • Education, training and public awareness related to climate change. • Climate-change-related research and monitoring as well as impact and vulnerability assessments. • Oceanographic and atmospheric research and monitoring.

APPENDIX C

Indicators of Progress from Paris Declaration

	OWNERSHIP	TARGET FOR 2010
1	*Partners have operational development strategies* – Number of countries with national development strategies (including PRSs) that have clear strategic priorities linked to a medium-term expenditure framework and reflected in annual budgets.	**At least 75% of partner countries** have operational development strategies.
	ALIGNMENT	**TARGET FOR 2010**
2	*Reliable country systems* – Number of partner countries that have procurement and public financial management systems that either (a) adhere to broadly accepted good practices or (b) have a reform programme in place to achieve these.	(a) **Public financial management** – Half of partner countries move up at least one measure (*i.e.*, 0.5 points) on the PFM/ CPIA (Country Policy and Institutional Assessment) scale of performance. (b) **Procurement** – One-third of partner countries move up at least one measure (*i.e.*, from D to C, C to B or B to A) on the four-point scale used to assess performance for this indicator.
3	*Aid flows are aligned on national priorities* – Percent of aid flows to the government sector that is reported on partners' national budgets.	**Halve the gap** – halve the proportion of aid flows to government sector not reported on government's budget(s) (with at least 85% reported on budget).
4	*Strengthen capacity by co-ordinated support* – Percent of donor capacity-development support provided through co-ordinated programmes consistent with partners' national development strategies.	**50% of technical co-operation flows** are implemented through co-ordinated programmes consistent with national development strategies.
5a	*Use of country public financial management systems* – Percent of donors and of aid flows that use public financial management systems in partner countries, which either (a) adhere to broadly accepted good practices or (b) have a reform programme in place to achieve these.	PERCENTAGE OF DONORS TARGET / SCORE* **All donors** use partner countries' PFM systems. / 5+ **90% of donors** use partner countries' PFM systems. / 3.5 to 4.5 PERCENTAGE OF AID FLOWS TARGET / SCORE* **A two-thirds reduction** in the % of aid to the public sector not using partner countries' PFM systems. / 5+ **A one-third reduction** in the % of aid to the public sector not using partner countries' PFM systems. / 3.5 to 4.5
5b	*Use of country procurement systems* – Percent of donors and of aid flows that use partner country procurement systems which either (a) adhere to broadly accepted good practices or (b) have a reform programme in place to achieve these.	PERCENTAGE OF DONORS TARGET / SCORE* **All donors** use partner countries' procurement systems. / A **90% of donors** use partner countries' procurement systems. / B PERCENTAGE OF AID FLOWS TARGET / SCORE* **A two-thirds reduction** in the % of aid to the public sector not using partner / A **A one-third reduction** in the % of aid to the public sector not using partner countries' procurement systems. / B
6	*Strengthen capacity by avoiding parallel implementation structures* – Number of parallel project implementation units (PIUs) per country.	**Reduce by two-thirds** the stock of parallel project implementation units (PIUs).

	ALIGNMENT	TARGET FOR 2010
7	*Aid is more predictable* – Percent of aid disbursements released according to agreed schedules in annual or multi-year frameworks.	**Halve the gap** halve the proportion of aid not disbursed within the fiscal year for which it was scheduled.
8	*Aid is untied* – Percent of bilateral aid that is untied.	**Continued progress over time.**
	HARMONISATION	**TARGET FOR 2010**
9	*Use of common arrangements or procedures* – Percent of aid provided as programme-based approaches.	**66% of aid flows** are provided in the context of programme-based approaches.
10	*Encourage shared analysis* – Percent of (a) field missions and/or (b) country analytic work, including diagnostic reviews that are joint.	(a) **40% of donor missions** to the field are joint. (b) **66% of country analytic work is joint.**
	MANAGING FOR RESULTS	**TARGET FOR 2010**
11	*Results-oriented frameworks* – Number of countries with transparent and monitorable performance assessment frameworks to assess progress against (a) the national development strategies and (b) sector programmes.	**Reduce the gap by one-third** – Reduce the proportion of countries without transparent and monitorable performance assessment frameworks by one-third.
	MUTUAL ACCOUNTABILITY	**TARGET FOR 2010**
12	*Mutual accountability* – Number of partner countries that undertake mutual assessments of progress in implementing agreed commitments on aid effectiveness including those in this Declaration.	**All partner countries** have mutual assessment reviews in place.

Important Note: In accordance with paragraph 9 of the Declaration, the partnership of donors and partner countries hosted by the DAC (Working Party on Aid Effectiveness) comprising OECD/DAC members, partner countries and multilateral institutions, met twice, on 30-31 May 2005 and on 7-8 July 2005 to adopt, and review where appropriate, the targets for the twelve Indicators of Progress. At these meetings an agreement was reached on the targets presented under Section III of the present Declaration. This agreement is subject to reservations by one donor on (a) the methodology for assessing the quality of locally-managed procurement systems (relating to targets 2b and 5b) and (b) the acceptable quality of public financial management reform programmes (relating to target 5a.ii). Further discussions are underway to address these issues. The targets, including the reservation, have been notified to the Chairs of the High-level Plenary Meeting of the 59th General Assembly of the United Nations in a letter of 9 September 2005 by Mr. Richard Manning, Chair of the OECD Development Assistance Committee (DAC).

***Note on Indicator 5:** Scores for Indicator 5 are determined by the methodology used to measure quality of procurement and public financial management systems under Indicator 2 above.

APPENDIX D

Proposed List of OECD indicators: Overview by group and by theme

The proposed list of indicators presented below includes:

- M: **Main indicators** (numbered and in bold), and their components or supplements (numbered):
- P: **Proxy indicators** (bulleted) when the main indicators are currently not measurable

The proposed indicators are to be accompanied with contextual information or additional indicators to accompany the message conveyed.

Each indicator is accompanied with a first evaluation of its relevance for green growth (R), its analytical soundness (S), and the measurability of the underlying data (M). The classifications used for evaluating the indicators are as follows:

Criteria	Classification
Relevance (R)	1= high 2= medium 3= be further reviewed
Analytical soundness (S)	1= good 2= average 3= to be further reviewed
Measurability (M)	S = short term basic data currently available for a majority of OECD countries; M = medium term basic data partially available, but calling for further efforts to improve their quality (consistency, comparability, timeliness) and their geographical coverage (number of countries covered) L = long term basic data not available for a majority OECD of countries, calling for a sustained data collection and conceptual efforts.

Proposed list of indicators

The socio-economic context and characteristics of growth			
Economic growth, productivity and competitiveness	**Economic growth and structure** GDP growth and structure; Net disposable income	M	
	Productivity and trade Labour productivity; multi-factor productivity Trade weighted unit labour costs Relative importance of trade: (exports + imports)/GDP **Inflation and commodity prices**	M	
Labour markets, education and income	**Labour markets** Labour force participation & unemployment rates	M	
	Socio-demographic patterns Population growth, structure & density Life expectancy: years of healthy life at birth Income inequality: GINI coefficient Educational attainment: Level of and access to education	M	

Group/theme	Proposed indicators	Type	R	S	M
Environmental and resource productivity					
Carbon & energy productivity	**1. CO_2 productivity**				
	1.1. Production-based CO_2 productivity GDP per unit of energy-related CO_2 emitted	M	1	1	S
	1.2. Demand-based CO_2 productivity Real income per unit of energy-related CO_2 emitted	M	1	2	S/M
	2. Energy productivity				
	2.1. Energy productivity (GDP per unit of TPES)	M	2	1	S
	2.2. Energy intensity by sector (manufacturing, transport, households, services)	M	2	1	S/M
	2.3. Share of renewable energy in TPES, in electricity production	M	1	1	S
Resource productivity	**3. Material productivity (non-energy)**				
	3.1. Demand based material productivity (comprehensive measure; original units in physical terms) related to real disposable income	M	1	3	M/L
	• Domestic material productivity (GDP/DMC) - Biotic materials (food, other biomass) - Abiotic materials (metallic minerals, industrial minerals)	P	1	2	S/M
	3.2. Waste generation intensities and recovery ratios By sector, per unit of GDP or VA, per capita	M	1	1	M/L
	3.3. Nutrient flows and balances (N,P)	M	1	3	L
	• Nutrient balances in agriculture (N, P) per agricultural land area and change in agricultural output	P	2	1	S/M
	4. Water productivity VA per unit of water consumed, by sector (for agriculture: irrigation water per hectare irrigated)	M	1	1	M
Multi-factor productivity	**5. Multi-factor productivity reflecting environmental services** (comprehensive measure; original units in monetary terms)	M	1	2	M/L
Natural asset base					
Renewable stocks	**6. Freshwater resources** Available renewable resources (groundwater, surface water, national, territorial) and related abstraction rates	M	1	1	S/M
	7. Forest resources Area and volume of forests; stock changes over time	M	1	1	S/M
	8. Fish resources Proportion of fish stocks within safe biological limits (global)	M	1	1	S
Non-renewable stocks	**9. Mineral resources** Available (global) stocks or reserves of selected minerals (tbd): metallic minerals, industrial minerals, fossil fuels, critical raw materials; and related extraction rates	M	1	2	M/L
Biodiversity and ecosystems	**10. Land resources** Land cover types, conversions and cover changes State and changes from natural state to artificial or man-made state	M	1	1	M/L
	• Land use: state and changes	P	1	2	S/M
	11. Soil resources Degree of top soil losses on agricultural land, other land	M	1	2	M/L
	• Agricultural land area affected by water erosion by class of erosion	P	1	2	S/M
	12. Wildlife resources (tbd)				
	• Trends in farmland or forest bird populations or in breeding bird populations	P	1	2	S/M
	• Species threat status: mammals, birds, fish, vascular plants in % species assessed or known	P	2	2	S
	• Trends in species abundance	P	1	2	S/M

Environmental quality of life					
Environmental health and risks	**13. Environmentally induced health problems & related costs** (e.g. years of healthy life lost from degraded environmental conditions)	M	1	3	L
	• Population exposure to air pollution	P	2	2	S/M
	14. Exposure to natural or industrial risks and related economic losses	M	1	2	L
Environmental services and amenities	**15. Access to sewage treatment and drinking water**	M			
	15.1. Population connected to sewage treatment (at least secondary, in relation to optimal connection rate)		2	2	S/M
	15.2. Population with sustainable access to safe drinking water	–	1	2	S/M
Economic opportunities and policy responses					
Technology and innovation	**16. R&D expenditure of importance to GG**	M	1	1	S/M
	- Renewable energy (in % of energy related R&D)		1	1	S
	- Environmental technologies (in % of total R&D, by type)		1	1	S
	- All purpose business R&D (in % of total R&D)		1	1	S
	17. Patents of importance to GG	M	1	1	S/M
	in % of country applications under the Patent Cooperation Treaty				
	- Environmentally related and all-purpose patents		1	1	S/M
	- Structure of environmentally related patents		1	1	S/M
	18. Environment-related innovation in all sectors	M			
Environmental goods and services	**19. Production of environmental goods and services (EGS)**	M	1	2	S/M
	19.1. Gross value added in the EGS sector (in % of GDP)				
	19.2. Employment in the EGS sector (in % of total employment)				
International financial flows	**20. International financial flows of importance to GG**		2	1	L
	(in % of total flows; in % of GNI)				
	20.1. Official Development Assistance		2	1	S
	20.2. Carbon market financing		2	1	S
	20.3. Foreign Direct Investment (tbd)		3	3	L
Prices and transfers	**21. Environmentally related taxation**	M	2	2	S/M
	- Level of environmentally related tax revenues (in % of total tax revenues, in relation to labour related taxes)				
	- Structure of environmentally related taxes (by type of tax base)		2	2	S/M
	22. Energy pricing (share of taxes in end-use prices)	M	1	1	S
	23. Water pricing and cost recovery (tbd)	M	1	2	S/M
	To be complemented with indicators on:				
	• *Environmentally related subsidies (tbd)*		1	3	M/L
	• *Environmental expenditure: level and structure* *(pollution abatement and control, biodiversity, natural resource use & management)*		2	1	L
Regulations and management approaches	*Indicators to be developed*		..	..	..
Training and skill development	*Indicators to be developed*		..	..	..

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